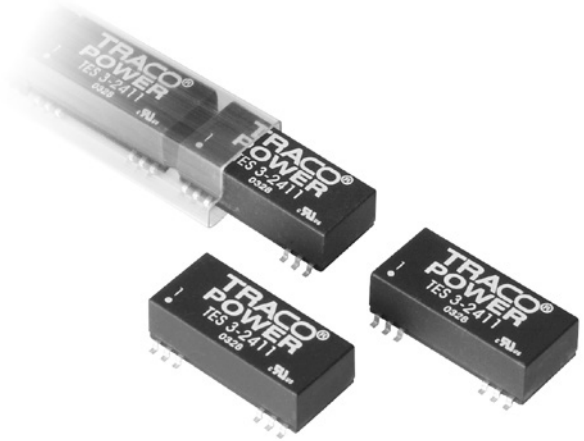


## Features

- ◆ SMD package
- ◆ Wide 2:1 input voltage range
- ◆ I/O isolation 1500VDC
- ◆ Under voltage lockout
- ◆ Operating temp. range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- ◆ Short circuit protection
- ◆ High accuracy of pin co-planarity
- ◆ Lead free design – RoHS compliant
- ◆ 3-years product warranty



The TES-3 series is a family of high performance 3W dc-dc converter modules featuring wide 2:1 input voltage ranges. The 15 models come in a low profile SMD package with dimensions of 32.3 x 14.8 x 10.2 mm. A high efficiency allows an operating temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  at full load. This product is qualified for soldering in a high temperature lead-free reflow solder process. Typical applications for the converters are battery operated equipment, instrumentation, communication and industrial electronics, everywhere where an isolated, tightly regulated voltage is required.

## Models

Ordercode	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TES 3-1210	<b>9 – 18 VDC</b> (12 VDC nominal)	3.3 VDC	700 mA	75 %
TES 3-1211		5 VDC	600 mA	79 %
TES 3-1212		12 VDC	250 mA	82 %
TES 3-1222		$\pm 12$ VDC	$\pm 125$ mA	81 %
TES 3-1223		$\pm 15$ VDC	$\pm 100$ mA	81 %
TES 3-2410	<b>18 – 36 VDC</b> (24 VDC nominal)	3.3 VDC	700 mA	76 %
TES 3-2411		5 VDC	600 mA	80 %
TES 3-2412		12 VDC	250 mA	83 %
TES 3-2422		$\pm 12$ VDC	$\pm 125$ mA	82 %
TES 3-2423		$\pm 15$ VDC	$\pm 100$ mA	82 %
TES 3-4810	<b>36 – 75 VDC</b> (48 VDC nominal)	3.3 VDC	700 mA	76 %
TES 3-4811		5 VDC	600 mA	80 %
TES 3-4812		12 VDC	250 mA	83 %
TES 3-4822		$\pm 12$ VDC	$\pm 125$ mA	82 %
TES 3-4823		$\pm 15$ VDC	$\pm 100$ mA	82 %

### Input Specifications

Input current no load / full load	12 Vin models: 20 mA / 300 mA typ. 24 Vin models: 5 mA / 150 mA typ. 48 Vin models: 3 mA / 75 mA typ.
Start-up voltage / under voltage shut down	12 Vin models: 6 VDC / 8 VDC typ. 24 Vin models: 12 VDC / 16 VDC typ. 48 Vin models: 24 VDC / 32 VDC typ.
Surge voltage (1 sec. max.)	12 Vin models: 25 V max. 24 Vin models: 50 V max. 48 Vin models: 100 V max.
Reverse voltage protection	0.5 A max.
Reflected input ripple current	can be reduced by ext. 1–2.2 µF polyester film capacitor
Input filter	Pi filter

### Output Specifications

Voltage set accuracy	±1 %
Regulation	– Input variation Vin min. to Vin max. – Load variation 10 – 100 % single output models: 1.0 % max. dual output models balanced load: 1.0 % max. dual output models unbalanced load: 2.0 % max.
Ripple and noise	50 mVpk-pk max.
Temperature coefficient	±0.02 %/°C
Current limitation	>110 % of Iout max., continuous
Short circuit protection	hiccup mode, indefinite (no automatic recovery)
Capacitive load	– single output models: 4700 µF – dual output models: 180 µF

### General Specifications

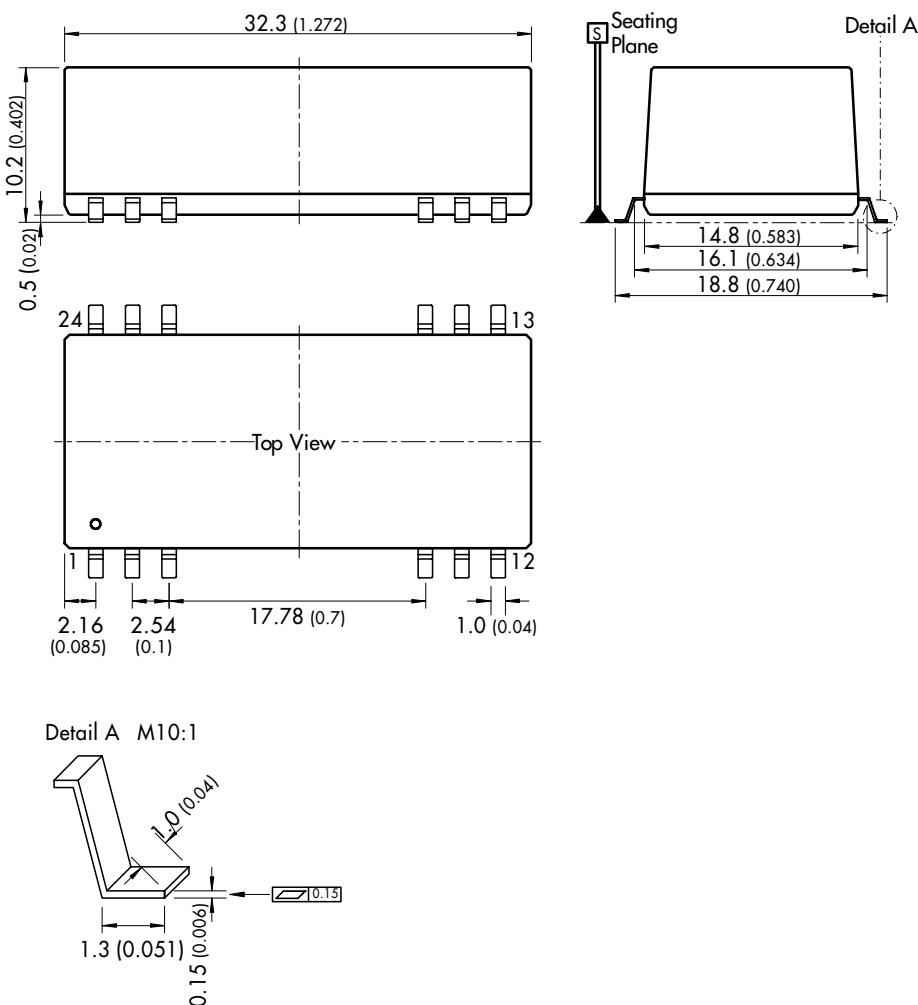
Temperature ranges	– Operating: –40°C to +85°C – Case temperature: +100°C max. – Storage: –40°C to +125°C
Derating (convection cooling)	3.5 %/K above 70°C
Humidity (non condensing)	95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)	>1'000'000 h
Isolation voltage (60 sec.) – Input/Output	1'500 VDC
Isolation capacitance – Input/Output	65 pF typ.
Isolation resistance – Input/Output	>1'000 Mohm
Switching frequency	300 kHz typ. (frequency modulation PFM)
Safety standards	UL 60950-1, IEC/EN 60950-1
Safety approvals	CSA File No. 226037 <a href="http://directories.csa-international.org">http://directories.csa-international.org</a>

All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

**Physical Specifications**

Casing material	non conductive black plastic (UL 94V-0-rated)
Package weight	6 g (0.21 oz)
Lead-free reflow solder process	as per J-STD-020D.1 (to find at: <a href="http://www.jedec.org">www.jedec.org</a> - free registration required)
Moisture sensitivity level (MSL)	level 2 as per J-STD-033B.1 (to find at: <a href="http://www.jedec.org">www.jedec.org</a> - free registration required)
Washing process	<a href="http://www.tracopower.com/products/smd-wash.pdf">www.tracopower.com/products/smd-wash.pdf</a>
Packaging	<a href="http://www.tracopower.com/products/tes3-pack.pdf">www.tracopower.com/products/tes3-pack.pdf</a>

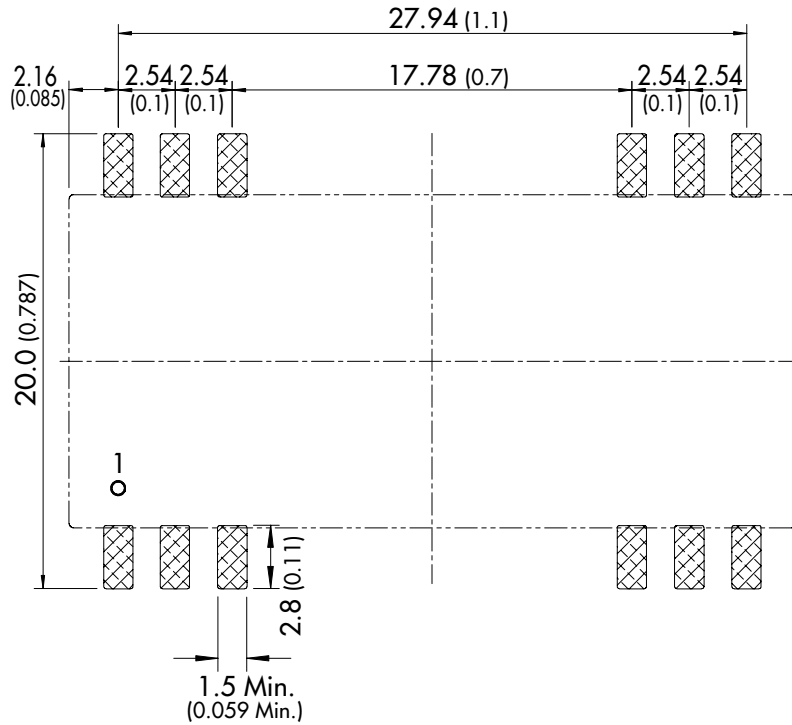
**Outline Dimensions mm (inches)**



Pin-Out		
Pin	Single	Dual
1	-Vin (GND)	-Vin (GND)
2	-Vin (GND)	-Vin (GND)
3	NC	NC
10	NC	Common
11	NC	NC
12	NC	-V Output
13	+V Output	+V Output
14	NC	NC
15	-V Output	Common
22	NC	NC
23	+Vin (Vcc)	+Vin (Vcc)
24	+Vin (Vcc)	+Vin (Vcc)

Dimensions in [mm], (I) = Inch  
Tolerances  $\pm 0.25$  ( $\pm 0.01$ )  
Pin pitch tolerances  $\pm 0.05$  ( $\pm 0.002$ )

**Solder Pad Dimensions mm (inches)**



Dimensions in [mm], ( ) = Inch  
Tolerances  $\pm 0.25$  ( $\pm 0.01$ )  
Pin pitch tolerances  $\pm 0.05$  ( $\pm 0.002$ )

Specifications can be changed without notice! Make sure you are using the latest documentation, downloadable at [www.tracopower.com](http://www.tracopower.com)